There are two main theories propounded, each of which has numerous authorities behind it. One school of Germans arrives at the conviction that every leukemia, whether clinically it be lymphatic, splenic, or mixed in type, is due to disease of all the blood-forming tissues in every part of the body; though one tissue may be more advanced in its involvement, and so determine the clinical type. A second school believes that there are two distinct leukemias, a lymphatic due to disease of lymphatic tissues all over the body, and a myeloid due to disease of the bone-marrow. Those who are interested in this discussion should read an article by Naegeli,[1] in which he reviews and dissects 156 articles on leukemia that have appeared in current literature during the past decade, mainly in German literature. After finishing Naegeli's fifty pages of text, however, one feels but little enlightened as to the truth, no matter how interested by the argument.

3. Is leukemia a common disease in children? Fortunately we can answer this question in the negative. For a long time it was believed that it never occurred except in adult life. But gradually one case after another in childhood has been reported here and there by different observers. Still the total number is small, only about 50,[2] and the disease is, therefore, an uncommon one under ten years of age. When it occurs, the great majority of cases, like those herewith reported, are of the lymphatic type and run an acute course. All observers agree that the splenomedullary type is distinctly rare in childhood.

4. What can we do in the way of treatment? Absolutely nothing that holds out any hope of cure. Arsenic, *x*-ray applications, iron, transfusion, rest, oxygen, red bone marrow, all alike have failed. There is no known remedy that seems even to stay the course of the disease. Once the diagnosis is positive, the case is hopeless. Let us be thankful that such a diagnosis does not frequently have to be made.

MANAGEMENT OF FAILURE OF THE CIRCULATORY BALANCE IN CHRONIC INTERSTITIAL NEPHRITIS.

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For the purpose of laying a foundation for an intelligent consideration of the management of failure of the circulatory balance in chronic interstitial nephritis an introductory paragraph is desirable.

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[1] Ergebnisse der Innern Medizin und Kinderheilkunde, fünfter band, 1910, p. 222

[2] Veeder, Archives of Pediatrics, January, 1911, p. 43.

The circulatory current begins with the secretion of the chyle into the intestinal lymphatics, continues through the thoracic duct, and enters the sanguineous system on the venous side near the heart, makes the lesser circuit, and is forced through the arteries and capillaries by the left ventricle. From the blood a requisite amount of nutritive material, in watery solution, is secreted through the capillary walls and enters the great extravascular circulation as tissue serum, and diffuses through the intercellular and larger serous spaces. In due course this liquid, contaminated by unused nutritive elements and waste matters, is secreted into the lymphatic radicles and conveyed through a system of ducts and purifying and filtration glands into the venous current. Portions of this liquid are also secreted into the venous ends of the capillaries and conveyed, with the surplus blood which passes the capillary barriers, through the veins to the right side of the heart. Other portions may be excreted by the kidneys, intestines, etc. The harmful materials, in aqueous solution, are directly or indirectly excreted mainly through the kidneys. The highly selective secretory and excretory functions of the specific cells of the lacteals, capillaries, lymphatics, kidneys, etc., are essentially vital, aided by the more measurable influences of composition, tension, pressure, velocity, etc., of the circulatory fluids and other physical and chemical factors. Although not demonstrable, nor indubitable, we may assume that the circulatory balance includes abundant direct and compensatory integrity and reserve capacity in circulatory fluids of adequate nutritive value, cardiac competency, vasomotor efficiency, transit-secretory activity, and other important factors.

In the cardiovascular-nephritic malady technically known as chronic interstitial nephritis there is found, in advanced cases, marked myocardial hypertrophy, arterial thickening, and renal fibrosis; the cardiac contractions are forcible, with increased resistance at the arterial terminals and great destruction of renal secretory tissue; the arterial circulation is energized, the venous flow is obstructed, and the tissue serum movement is retarded; the blood pressure is elevated, the proportion of venous blood is above the normal, and the tissue serum is largely increased in amount and altered in character. Under these circumstances the circulatory balance is deficient in reserve capacity, lacking in compensatory adaptability, delicately adjusted, and is comparatively easily broken. The loss of this balance may depend upon many factors, the majority of which are obscure or unknown. Although there may be other factors of equal or greater importance, with our present knowledge closest attention should be given to those which are obtrusively obvious, as myocardial weakness, especially that connected with insufficiency of the right auricular and ventricular aspiratory function; increased tenseness of peripheral obstruction; relative lymphatic incompetency; lessened areolar-tissue resiliency;

notable deviation from the normal composition of the tissue serum in many particulars, but especially in a diminution of the attraction, or adhesive viscosity of this liquid—in which the cells of the body may participate—by which the tissue serum is held in the intercellular spaces. It is probable that the most important of these, in the earlier stages, are venous stasis, lymphatic insufficiency, and cardiac suction failure.

Under these conditions of strain the circulatory balance is maintained partially, fitfully, and with difficulty; and often only by unconscious recourse to various devices for stimulating supplementary circulatory agencies, as, for example, a restless muscular activity, etc. In my experience manifest failure has usually followed some acute infectious malady.

Among the earliest readily recognizable signs of circulatory failure in these cases may be mentioned an increase in body weight, general plumpness, tenseness of all the tissues of the body, and an exaltation of the already high blood pressure. The face becomes fuller, and the trunk and extremities are symmetrically rounded out. Palpation reveals an increased sense of resistance, but there is no pitting upon pressure. Occult edema is present; manifest edema is imminent. The special subjective symptoms, although not robustly obtrusive, are nevertheless very significant. The physical activities of the patient are now curtailed; there is dyspnea upon unusual exertion; there is also sufficient dyspnea upon first assuming the recumbent posture to lead to the use of an additional pillow, and often this is supplemented by placing the arm under the pillows in order to further raise the head; he does not sleep as well as formerly, and occasionally he may be awakened by a severe attack of nocturnal dyspnea.

With progressive increase in the arteriocapillary obstruction and venous engorgement; with advancing myocardial weakness and dilatation; with an augmenting load of slowly moving tissue serum and lymphatic insufficiency; and after a period, which may be unexpectedly prolonged, during which there occurs a more or less urgent alignment of every primary reserve and supplementary force in an effort to sustain the toppling structure, the circulatory balance is definitely broken. The cardiac cavities are distended, probably with functional valvular insufficiency, and to the right auricular and ventricular aspiratory incompetency there is added the backward pressure of regurgitation. There is additional embarrassment in the venous circulation, especially in the liver, and dependent parts. Everywhere arteriosclerotic degenerative changes have become more marked, but especially is this true in the kidneys, where the widely spread atrophic changes in the arterioles and glomerular tufts and large increase of connective tissue produces the characteristic contracted kidney of this disease. Cellular destruction may account for the leakage of albumin into the urine.

The tenuous lymphatic radicles are compressed and, consequently and otherwise, relatively incompetent. The tissue serum is enormously increased in volume; it has become overburdened with toxic cellular wastes, and laden with an excess of salts; it is relatively, possibly absolutely, deficient in nutritive materials, and may have become notably acid in reaction; it has lost, markedly, in the quality of viscosity, and is not well held in the intercellular spaces, from whence it largely gravitates to the dependant parts, where it fills to distention the areolar tissue spaces and forms the characteristic dropsy of the "cardiac type."

The objective and subjective symptoms are prominent. There is a further increase in body weight. In the maintained upright posture the face, neck, and upper portions of the chest, parts which had been full and plump during the stage of occult edema, may be free from swelling; indeed, there may be here a noticeable deficiency of liquids. The lower limbs, genitalia, and other dependant parts are distended with dropsical fluids. In the edematous territory there is increased resistance offered to the palpating finger, and pitting follows pressure. The face and other regions from which the tissue serum has gravitated present more color than prevailed during the preceding stage, and they frequently show areas of brownish discoloration. In edema-free parts the muscles are flaccid, and there is usually absence of subcutaneous fats. As compared with earlier periods, the urine is less copious, of deeper color, of higher specific gravity, of increased acidity; it contains a larger proportion of salts, is more regularly and abundantly albuminous, and usually contains hyaline and granular casts. The blood pressure usually remains at its previous high levels. The patient is disabled. There is dyspnea upon slight exertion. He is unable to assume a horizontal position. With carefully adjusted supports he may be able to attain a more or less exaggerated semirecumbent posture; often this is impossible, and the tired sufferer obtains sleep only in various deviations from the upright position. He may be able to rest with the shoulders and head supported and inclined slightly backward. In some cases no pressure upon the back can be borne, and the patient sits erect, with or without inclination to one or the other side. In the most distressing cases he is compelled to lean forward with his head resting upon some supporting object. There may be Cheyne-Stokes respiration, frequently of slight degree; often it is typical; occasionally it is of the most distressing character. The pulse is increased in frequency and altered in character. Hemorrhages and other evidences of vascular degeneration occur. The natural course of these morbid processes is downward. Every phase of the circulatory embarrassment becomes more profound. The subjective symptoms increase in distressing features. Cerebral hemorrhage, or thrombosis, often occurs. Massive intestinal hemorrhages mark the exceptional case.

Toxemic coma or convulsions are not infrequent. Barring these and other somewhat accidental causes of death, the dropsical accumulation increases, rising higher and higher, and "when the water reaches the heart the patient dies."

Although rupture of the circulatory balance in this malady is not a common incident, nevertheless it should be considered as one of the possibilities sure to arise in a certain proportion of cases; indeed the likelihood of its appearance may be foretold with such fair assurance that the prediction may be verified by subsequent events. The recognition of the imminence, or actual presence of the lighter degrees of such failure is one of the fine arts of diagnosis; confirmed occult edema may be readily detected by any physician; the laity require no professional aid in the diagnosis of dependant dropsy.

How shall the cardiovascular-nephritic patient be protected from failure of the circulatory balance? Notwithstanding the paucity of etiological knowledge and the futility of attempts toward materially improving the pathological conditions, I am, nevertheless, of the opinion that earnest efforts along rational lines should be made toward conserving the patient's existing status, and, if possible, increasing his circulatory capacity. Not only this, but the conclusions which may be deduced from my observations are erroneous if the results of such well-directed measures are not generally beneficient.

The basic plan which I employ is, briefly, as follows: At intervals the patient is examined in such detail as to give such information as may be required concerning his environment and habits; nutritional requirements and supply; excretory capabilities and output; circulatory burden and reserve capacity. Upon the facts disclosed is based the advice given.

It is well to inform the patient that he has chronic interstitial nephritis, a malady in which the cardiac, vascular, and extravascular circulatory systems also participate fundamentally; that the disease is incurable, and the damages done are irreparable; that it is accompanied by inherent extra risks and dangers, and necessitates certain closely drawn restrictions; that, within limited bounds and probabilities, it is not incompatible with comfort, activity, usefulness, and possible long life.

The prescribed directions for diet, regimen, and medication should be based upon the requirements for the individual, as determined by the full examinations mentioned as preliminary to any advice. The diet should meet the caloric and other nutritional requirements of the patient; should consist of available foods and should be definitely formulated in terms comprehensible to the individual. The following is an example:

DIET. *Breakfast.* Take large helpings of bulky fruits, such as apples, pears, peaches, plums, prunes, cherries, strawberries, grape fruit, bananas, melons, etc. Take an egg and two thin slices of bacon. Take an ordinary slice of bread, or an equivalent of toast, muffin, biscuit, wheat cakes, waffles, cereal, etc. Take tea, cocoa, coffee, milk, water, or carbonated water.

Luncheon. Take a very large helping of some vegetable salad, such as lettuce, tomato, asparagus, endive, etc., with a palatable dressing. There may be added pickles, olives, or other similar relish. Take a moderate amount of cheese. Take breads and liquids as at breakfast.

Dinner. Take vegetable, milk, or cream soups in variety. Take a piece of meat, fowl, fish, or game, about 2 by 2 by ½ inch in size. Take moderately of gravies. Take very freely of all kinds of succulent vegetables, as asparagus, spinach, carrots, turnips, parsnips, pease, string and Lima beans, beets, beet-tops, onions, corn, tomatoes, celery, squash, marrows, cauliflower, cabbage, Brussels sprouts, mushrooms, etc. Take moderately of potato, sweet potato, rice, and other starchy foods. Take breads and liquids as at breakfast. Take moderately or sparingly of simple desserts.

Notes. The total amount of food taken should be the smallest which will maintain nutrition at the highest level. For your purpose the best measure of this will be the maintenance of your present weight, and a sense of well being. Should there be a tendency to take on weight the quantities of bread, potato, and other starchy foods should be reduced; should the body weight decline, these foods should be taken more freely. To be sure, if, at the beginning, there should be over- or under-weight, these departures from a desirable weight should be corrected by under- or over-nutrition, continued until a satisfactory standard has been attained. As a rule, apples, peaches, pears, and similar fruits should be cooked. Succulent vegetables should be properly cooked, as should all foods requiring this process. At luncheon there may be substituted for the salad fruits, as at breakfast, or succulent vegetables, as at dinner. Under circumstances to be specifically defined from time to time, milk and cheese should be taken regularly at every meal. Upon rising, and also two and one-half or three hours after meals, take a small glass of water, or of carbonated water. There should be taken a total of from 3 to 3½ pints of liquids of all kinds during the twenty-four hours, unless specifically advised to the contrary. Avoid alcohol, foods which are notoriously difficult of digestion, and all foods which disagree.

REGIMEN. Take such a fair amount of active physical exercise as shall be specifically directed from time to time. Massage should replace active exercise should the latter be impracticable. Avoid as far as practicable exposure to infectious diseases; should these maladies be contracted there should be prompt and close medical supervision. Avoid tobacco. Avoid all feats of strength and endurance; all overexertion, strain, and undue exposure. The clothing should be comfortable. Comfortable bathing with regularity, or as to be specifically directed. The body weight should be taken weekly, and recorded. Once a week all the liquids taken should be measured, as well as all the urine voided, and record made of the same. Should the bowel movements be liquid an estimate should be made of the quantity and record made of the same. Specimens of the twenty-four hours' urine, measured and labeled, should be submitted for examination once a week, fortnight, or month, as specified. Directions to be given as to the methods by which the above shall be done. Should there occur headaches, disturbances of vision, difficulties of breathing, nocturnal dyspnea, the requirement for more than one pillow in sleeping, rapid increase in weight, swelling of the feet, or any other event which is out of the ordinary, or which is not understood, consult your physician at once. Submit yourself, at the regularly appointed times, for full examination.

MEDICINAL. Once in four weeks, or as directed, take two freshly made pills of mercurial mass, of 5 grains each, every night for three days, followed the first time by half an ounce of castor oil in the morning, and the other two mornings by a saline cathartic. Other medication to be specifically directed.

Immediately upon the detection of the slightest evidences of circulatory embarrassment or occult edema, or of manifest dropsy or uremia, the patient should be given active and efficient treatment. He should be put to bed, in as nearly a horizontal position as possible, where he should remain until the circulatory balance has been restored. This I consider the most important medical measure which can be instituted, under the circumstances described, in these cases. The venous system is thus given an opportunity to drain itself easily; and the heart to regain its tone, largely because of the lessened strain upon its right-side aspiratory action, and the relief given to the ventricular contractions. In various ways probably every part of the circulatory system is offered more or less positive relief. It is usually advisable to prescribe efficient doses of an active preparation of digitalis, as, for example, the freshly prepared infusion of the best English leaves of the current year, properly gathered and preserved. At this time there should be no hesitation upon theoretical grounds pertaining to the exalted blood pressure; the bald fact remaining that it is not materially raised by this drug, in these cases under the circumstances mentioned. More or less vigorous massage is useful, probably by increasing the venous, lymphatic, and tissue-serum movement.

Already the composition of the tissue-serum is notably altered. It is especially significant that it contains an excess of sodium chloride; is usually acid to phenolphthalein; and is deficient in viscosity. If nutritive elements are present in normal amounts they are probably less available than in health, or the cells do not so readily appropriate them, for, certain it is that at this time there is a measurable decline in nutrition, particularly apparent in loss of reserve fats. The possibility of improving the character of this liquid by appropriate feeding lends peculiar importance to the diet at this time. The presence of an excess of chlorides in the tissue serum, together with the well known effects of sodium chloride in increasing edema, has led to the formulating of the so-called "salt-free" diet. While approving of giving this subject the most careful and favorable consideration, I wish here to enter an emphatic protest against dignifying the important process of adjusting the amount of table salt to the requirements and capacity of the body tissues by exalting it as a system of treatment. With the object in view of replacing the excess of sodium chloride by the like salt of lime, and possibly increasing the viscosity of the tissue serum, I am accustomed to give lime, preferably in the form of the lactophosphate, in fairly large doses, and with apparent benefit. The same results may be had by giving, in suitable quantities, milk, gelatine, and other lime-bearing foods. To my mind the question of how to maintain the mutual attraction between the tissue cells and tissue serum, and the viscosity of the latter, in order that this liquid, as it envelops the cells of the body, may move along with just sufficient velocity to allow a maximum amount of required nutritional cellular absorption, and of waste extrusion, is one, if not the most important and urgent, of the problems confronting us.

Reverting to the details of the diet at this time, it is clear that, because of the loss of reserve fats, and the use of the body proteids, as evidenced by the increased urea excretion and loss of weight, particular attention should be directed toward meeting, fully, the caloric requirements of the individual, and the directions for this should be definitely formulated by the physician. Until every vestige of tissue serum excess has been drained away, the intake of liquids should be well below that of excretion, as determined by actual weight and measure. With restored circulatory equilibrium the ingested liquids should approximate the standard which experimental study has proved to be most suitable for the patient. It is well, at this time to repeat the mercurial mass at more frequent intervals, and the saline may be given every morning, if the exigencies of the case requires. The rigidity of this plan of management may be lessened with precautionary oversight, but there should be a close adherence to the fundamental principles involved. These special measures should be continued for a sufficient time to allow as complete restoration of the circulatory balance as possible. This may be, in rare cases, about a month; usually at least six weeks are required; in some cases, especially those in which a recent infectious illness has been experienced, a much longer time will be necessary.

Between the stage of this malady which has been just considered and the terminal one is a wide gap and a long interval. During the intervening periods there will have been some in which the patient's condition is eminently satisfactory, the circumstances considered; others of relapses, disappointments, and distress. The management will have been one of increasing care and strictness, passing gradually through the steps intervening between those which have been mentioned and those which will now demand our attention.

In the stage to which I now refer the patient has passed through a prolonged period of great distress. There has been such respiratory distress as to prevent the patient assuming the recumbent posture, sleeping fitfully in his chair in a more or less erect and uncomfortable position. There have been a variety of uremic manifestations, such as headaches, wakefulness, muscular twitchings, visual scintillations, drowsiness, mental dullness and aberrations, etc. Retinal and other hemorrhages may have occurred. Occult edema has appeared, and gradually increased, with augmented distress, to the greatest tension, when, fitfully, the restraining barriers of intercellular tissue-serum attraction and areolar tissue resiliency gives way, and with notable relief from the distressing symptoms, dependent dropsy is an established fact. The patient is now in a present and visible danger; the management assumes an importance, not greater, but more acute. What shall it be?

Removal of the superfluous tissue serum is an essential first step. This is best accomplished by the use of elaterin. The method of procedure is important. During three days the diet should consist of thin gruels, cream and water soups, tea, coffee, water, and carbonated waters. The first and second days the total quantity should be about 1500 c.c. per day; during the third day the quantity should not exceed 1000 c.c., and the gruels and soups should be taken very sparingly or omitted. Every night, including the night preceding the first day, there should be taken 10 grains of mercurial mass, in two freshly-made pills of 5 grains each. The first following morning there should be taken an ounce of castor oil; on each of the other mornings there should be taken an efficient saline cathartic. Beginning with the fourth morning, give $\frac{1}{20}$ grain pure elaterin every hour for three doses; later $\frac{1}{10}$ grain every two hours until ten or twelve very free watery movements have been secured. This may require two or three days, during which time the patient should have no solid foods, and very little liquids. Later the standard diet, modified as may be required, should be gradually resumed. The total number of liquid stools will probably be from 15 to 20, and the quantity of tissue serum drained away, from 5 to 20 pounds. The filtered serum thus evacuated should be analyzed, and the results recorded. It is usually acid, straw or amber colored, having a specific gravity of from 1005 to 1030, and heavily laden with chlorides. The odor is sometimes peculiarly offensive. Following the intestinal drain the flow of urine usually becomes very free; I have seen the day's excretion reach the enormous quantity of 6000 c.c., when previously it had been scanty. The siphonage thus started ordinarily continues as a free flow until the edema has completely disappeared; nevertheless, this action should be assiduously encouraged and stimulated, for example, by the use of infusion of active digitalis leaves, theocine, external warmth, the recumbent position, etc. During the entire course the intake of liquids should be well below the output. The advantages of this method of removing dropsical liquids lies, primarily, in the fact that they are selectively excreted by the intestinal and renal cells, ordinarily the albuminous and other useful nutritive materials largely remaining behind.

In some cases, from various causes, the method thus shortly outlined is impracticable. It will then be necessary to remove the serum directly from the subcutaneous tissues, preferably by means of Southey's tubes. The pointed stylet makes an opening through the skin mainly by spreading the tissues; the small tubes are tightly grasped by the elastic tissues, thus preventing leakage; closure promptly follows removal of the tubes, and with the employment of full antiseptic precautions, infection is almost unknown. Two tubes in each leg, one inside and the other outside, inserted just above the ankle, or at any other more available points, are usually sufficient. Rubber tubes of the smallest caliber, as soft rubber catheters, should be attached to the ferruled ends of the silver tubes and tied with ligatures, the ends of which may be used in retaining the tubes in place. In this manner the surface is kept dry, the draining tissue-serum being conveyed to suitable receptacles, thereby adding to the comfort of the patient and reducing to a minimum the liability of infection. The patient should assume a semirecumbent posture, preferably sitting in a chair, or lying in a specially prepared bed which insures an inclined plane for the body, with the feet in the most dependent portion. He should be made as comfortable as possible, inasmuch as much fortitude is required. The drainage should be continued until the edema has largely disappeared, and the flow reduced to an insignificant amount. Usually there may be removed in this manner from 10 to 30 pints in twenty-four hours, and from four to seven days of gradually decreasing flow will be required to complete the process. The advantages of this method lie in the directness of the attack and the certainty of results; the very obvious objection to it is that the tissue serum is drained off as a whole, including its albumin and other nutritive materials. Upon removal of the tubes a dry antiseptic powder should be used and an elastic bandage applied to the feet and legs. The feet should be kept at a higher level than the hips. The small openings rapidly close under this management.

Removal of these large dropsical accumulations discloses an astounding degree of emaciation, although this may be anticipated with great exactitude from the moment when occult edema is detected. With complete exhaustion of the stored-up fats, and the patient's proteid tissues already heavily drawn upon, we are brought face to face with a very formidable situation, inasmuch as the continuation of this condition will lead to starvation acidosis, with all its distressing features. To meet this condition there will be required a most careful adjustment of the dietary, in the formulating of which close attention should be given to its every detail. The following may be considered as typical only, inasmuch as the individuality of the patient and his requirements must dictate the dietary:

	Grams.	Calories.
Breads of all kinds, a minimum of	124.0	496
Oatmeal, or other cereal, a minimum of	31.0	124
Rice, variously prepared, a minimum of	31.0	124
Potato, variously prepared a minimum of	62.0	248
Meat, fowl, or fish, lean, a minimum of	31.0	124
Meat, fat, a minimum of	31.0	279
Eggs, a minimum of	96.0	384
Sugar, a minimum of	15.5	139
Butter, a minimum of	15.5	155
Cream, 15 per cent., a minimum of	124.0	186
Milk, 3 per cent. cream, a minimum of	500.0	150
Cheese, a minimum of	15.5	162
Total		2571

To these there may be added, or to an equitable extent substituted for a portion, all kinds of succulent vegetables and fruits, properly prepared. The table salt should be limited to somewhat less than the secretory capacity of the patient's kidneys. The same should apply to the liquids taken; ordinarily from 1000 c.c. to 1500 c.c. is the proper quantity, but it should not exceed the output by the kidneys and intestines.

In conclusion, it is clearly impracticable to follow the various lines of management which should be pursued through the advancing stages to a fair or moderate symptomatic recovery; and quite impossible to do so through the deviousness of the downward path. Suffice it to say that some of the successes may well take rank among the marvels of medical achievement; and even in those, only too numerous, pursuing an unfavorable course, we may not infrequently feel assured that by giving our patients all the advantages of the methods and details of management which the present state of knowledge permits, with the measure of perception, tact, diligence, and fertility of resource which should be given them, their days have been lengthened and made more comfortable and useful.